TUBACEX GROUP

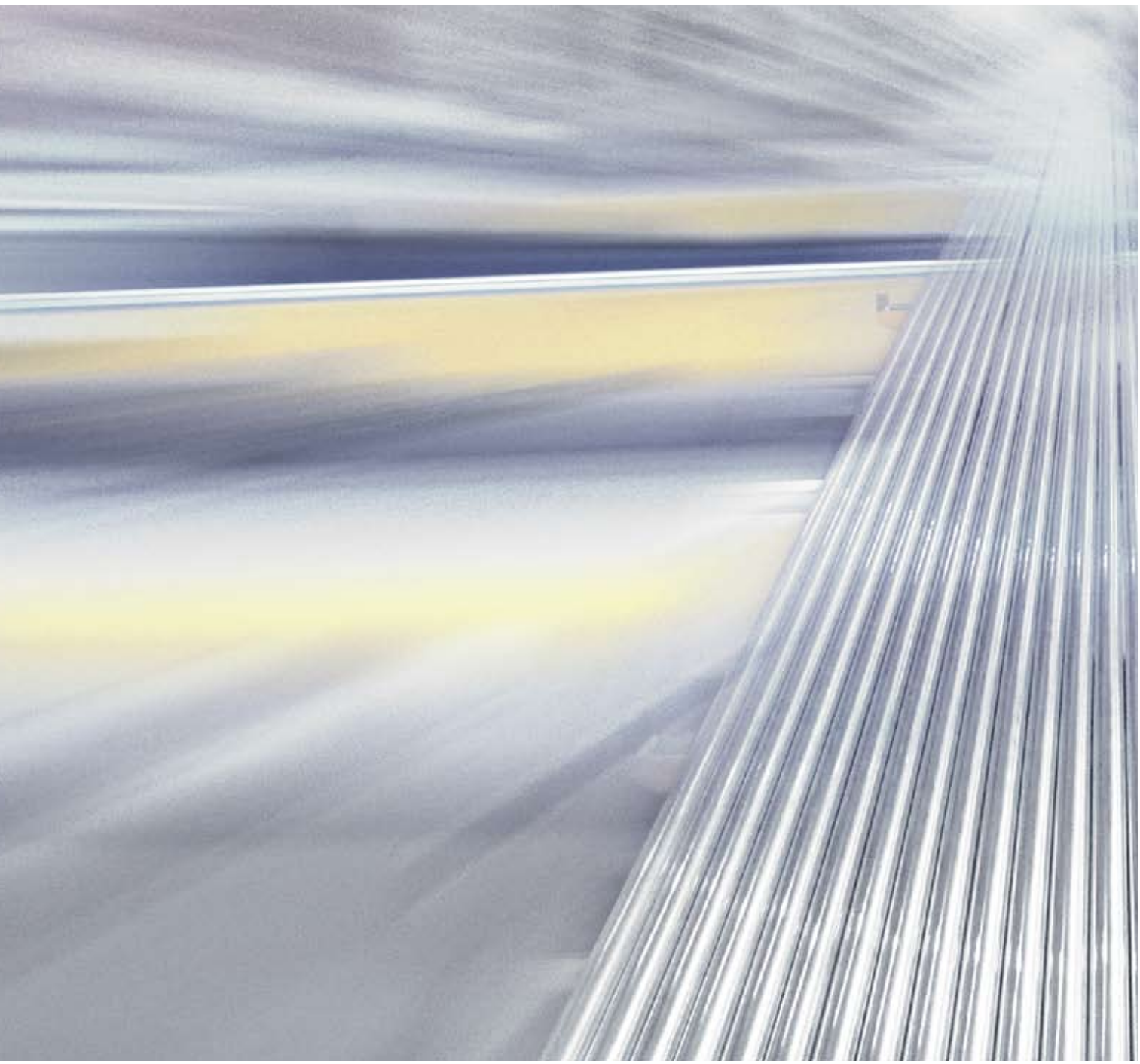
SURVEY OF GRADES

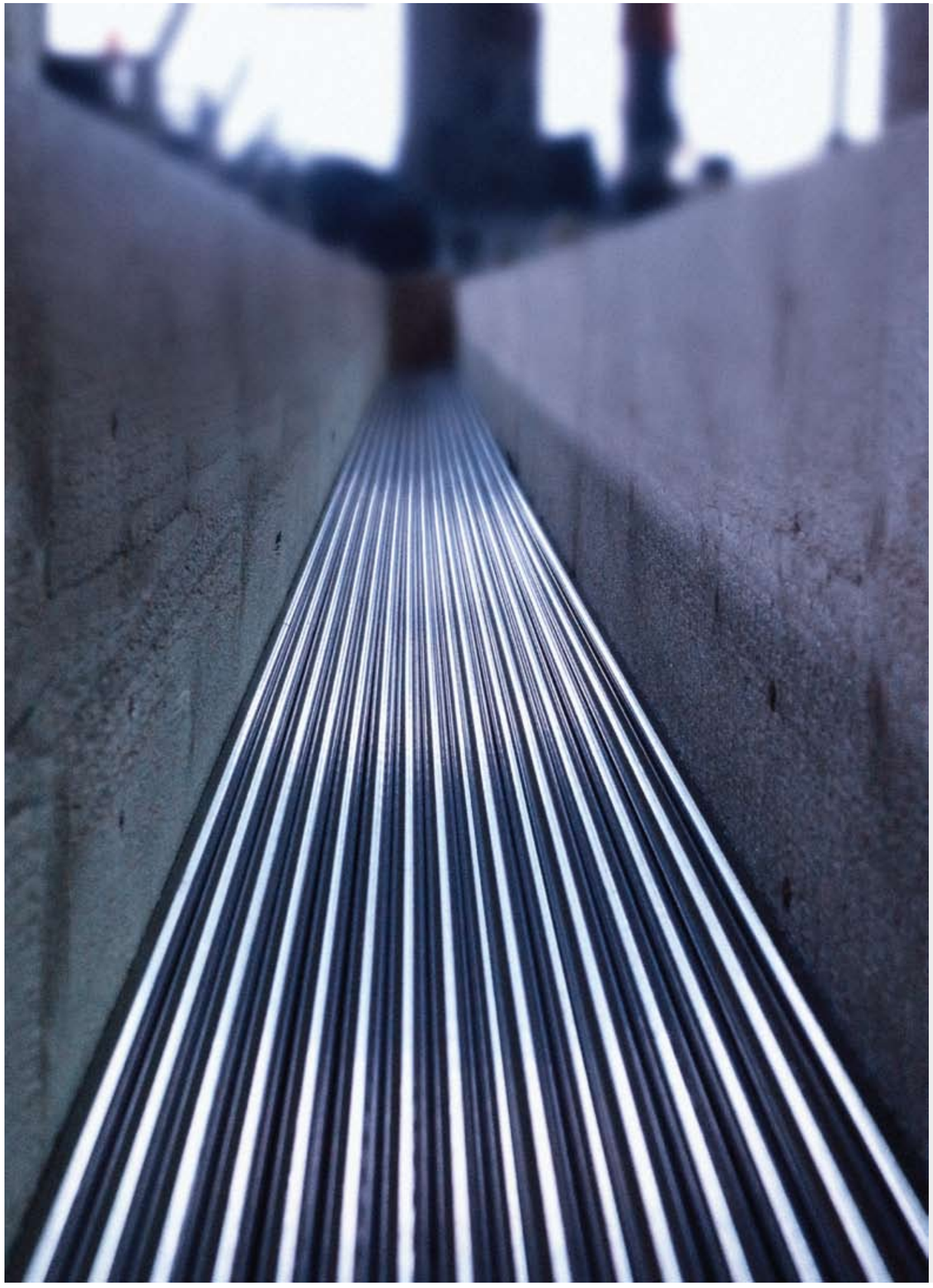
SEAMLESS STAINLESS STEEL | PIPES & TUBES

SCHOELLER BLECKMANN EDELSTAHLROHR

SEAMLESS · STAINLESS

NAHTLOS ZUM ERFOLG





STEEL GRADES

STANDARD AUSTENITIC STEELS

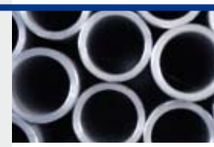
HEAT RESISTANT STEELS

FERRITIC STEELS

DUPLEX STEELS

UREA INDUSTRY STEELS

HIGH ALLOYED STEELS



CUSTOMER INFORMATION

This brochure contains a survey of grades for the production of our seamless pipes and tubes. Data sheets with the main characteristics of the respective steelgrades are available on request. If any special grade or finish is required, please contact us. Our technicans will provide you with additional information or advice.

The intention of this brochure is to give a survey of the characteristics of our products, but any warranty as to specific properties and values shall be subject in each instance to express agreement in writing.

To contact us please refer to:

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MISSION STATEMENT

We offer highest customer benefit.
It is our indicator for quality and performance.
All our acting is aimed at that.

Seamless pipes and tubes made of corrosion-, acid- and heat-resistant steels of highest quality are our core competence.

We achieve adequate profit as basis for the long-term company development.

STANDARD AUSTENITIC STEELS

TUBACEX NUMBER	ASTM TUBE STANDARDS A213 A269 A312 A511		EN TUBE STANDARDS 10216-5 10297-2		ELEMENTS (TYPICAL VALUES) IN %					MECHANICAL PROPERTIES AT ROOM TEMPERATURE				REMARK
	grade	**UNS**	**steel name**	**steel N°**	**C**	**Cr**	**Mo**	**Ni**	**others**	**hardness HRB$_{max.}$**	**yield R$_{p0,2\ min}$ [MPa]**	**tensile R$_{m\ min}$ [MPa]**	**elong. [%]**	
C01	TP304 TP304L	S30400 S30403	X5 Cr Ni 18 10 X2 Cr Ni 19 11 X2 Cr Ni 18 9	1.4301 1.4306 1.4307	max.0,03	18,5	–	10,2	–	90	205	515	40	for instrumentation tubing max. 80 HRB
C03	TP304LN	S30453	–	–	max.0,03	18,5	–	10,0	N 0,12	90	205	515	35	
C04	MT304 MT304L	S30400 S30403	X5 Cr Ni 18 10 X2 Cr Ni 19 11	1.4301 1.4306	max.0,03	18,5	–	10,2	S 0,025	HB 192	207	517	40	for hollow bar improved machinability
C05	TP304 TP304L	S30400 S30403	X5 Cr Ni 18 10 X2 Cr Ni 19 11	1.4301 1.4306	max.0,03	18,5	–	10,2	restr. Co, Nb + Ta < 0,15 %	90	205	515	40	nuclear application
C20	TP316 TP316L	S31600 S31603	X5 Cr Ni Mo 17 12 2 X2 Cr Ni Mo 17 13 2	1.4401 1.4404	max.0,03	17,0	2,2	12,0	–	90	205	515	40	for instrumentation tubing max. 80 HRB
C24	MT316 MT316L	S31600 S31603	X5 Cr Ni Mo 17 12 2 X2 Cr Ni Mo 17 12 2	1.4401 1.4404	max.0,03	17,0	2,2	12,0	S 0,025	HB 192	207	517	40	for hollow bar improved machinability
C25	TP316N TP316LN	S31651 S31653	X3 Cr Ni Mo Bn 17 13 3	1.4910	max.0,03	17,0	2,2	12,5	N 0,13	90	260	550	35	
C28	TP317 TP317L	S31700 S31703	–	–	max.0,03	18,5	3,2	13,5	–	90	205	515	35	
C30	TP316Ti	S31635	X6 Cr Ni Mo Ti 17 12 2	1.4571	0,06	17,0	2,2	12,0	Ti ≥ 5x(C+N)	90	205	515	35	for instrumentation tubing max. 80 HRB
C31	TP316 TP316L	S31600 S31603	X2 Cr Ni Mo 18 14 3 X3 Cr Ni Mo 17 13 3	1.4435 1.4436	max.0,03	17,5	2,7	13,0	–	90	205	515	40	for instrumentation tubing max. 80 HRB
C37	TP316 TP316L	S31600 S31603	X2 Cr Ni Mo 17 12 2 X2 Cr Ni Mo 17 12 2	1.4401 1.4404	max.0,02	17,0	2,2	12,0	restr. Co, Nb + Ta < 0,15 %	90	205	515	40	nuclear application

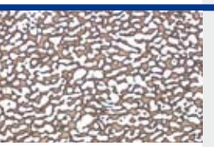
HEAT RESISTANT STEELS

TUBACEX NUMBEX	ASTM TUBE STANDARDS A213 A269 A312 A511		EN TUBE STANDARDS 10216-5 10297-2 SEW TUBE STANDARD 470		ELEMENTS (TYPICAL VALUES) IN %					MIN. MECHANICAL PROPERTIES AT ROOM TEMPERATURE				MAXIMUM OPERATING TEMP. IN AIR	REMARK
	grade	**UNS**	**steel name**	**steel N°**	**C**	**Cr**	**Mo**	**Ni**	**others**	**hardness $HRB_{max.}$**	**yield $R_{p0,2\ min}$ [MPa]**	**tensile $R_{m\ min}$ [MPa]**	**elong. [%]**	**T [°C]**	
T01	TP304 TP304H	S30400 S30409	X5 Cr Ni 18 10	1.4301	0,06	18,5	–	9,5	–	90	205	515	40	590	
T02	–	S30432	–	–	0,10	18	–	9	Cu 3	95	235	590	35	650	SUPER 304 H boiler application
T04	TP310S TP310H	S31008 S31009	X8 Cr Ni 25 21	1.4845	0,06	25	–	20	–	90	210	515	35	1050	
T06	TP347 TP347H	S34700 S34709	X6 Cr Ni Nb 18 10	1.4550	0,06	17,5	–	11,0	Nb ≥ 10xC	90	205	515	35	610	
T08	TP347	S34700	X6 Cr Ni Nb 18 10	1.4550	max.0,03	18,5	–	11	Co max.0,05; Nb ≥ 13xC	90	205	515	35	550	nuclear application
T09	TP321 TP321H	S32100 S32109	X6 Cr Ni Ti 18 10 X12 Cr Ni Ti 18 9	1.4541 1.4878	0,06	17,5	–	11,0	Ti ≥ 5x(C+N)	90	210	515	40	850	for instrumentation tubing max. 80 HRB
T10	TP321 TP321H	S32100 S32109	X6 Cr Ni Ti 18 10	1.4541	0,07	17,5	–	10,5	Co max.0,05; Ti ≥ 5 x(C+N)	90	205	515	35	850	nuclear application
T11	308[1]	S30800[1]	C15 Cr Ni Si 2012	1.4828 (SEW)	0,08	19,5	–	12,5	–	HB 223	230	500	30	1000	
T12	314[1]	S31400[1]	X15 Cr Ni Si 2520	1.4841 (SEW)	0,06	24,8	–	20	–	HB 223	230	550	30	1150	
T21	TP316 TP316H	S31600 S31609	X5 Cr Ni Mo 17 12 2	1.4401	0,05	17,0	2,2	11,5	–	90	205	515	40	610	for instrumentation tubing max. 80 HRB

[1] no applicable ASTM tube standard

FERRITIC STEELS

TUBACEX NUMBER	ASTM TUBE STANDARDS A268		EN TUBE STANDARDS 10297-2		ELEMENTS (TYPICAL VALUES) IN %					MIN. MECHANICAL PROPERTIES AT ROOM TEMPERATURE ANNEALED HARDENED & TEMPERED				REMARK
	grade	**UNS**	**steel name**	**steel N°**	**C**	**Cr**	**Mo**	**Ni**	**others**	**hardness HB**	**yield $R_{p0,2\ min}$ [MPa]**	**tensile $R_{m\ min}$ [MPa]**	**elong. [%]**	
M01	TP410	S41000	X12 Cr 13	1.4006	0,12	12,4	–	–	–	207 170-210	205 450	415 650	20 12	final HT 650°C
M05	TP410	S41000	X12 Cr 13	1.4006	0,12	12,4	–	–	restr. Co	207 170-211	205 450	415 650	20 12	nuclear
M06		GOST	08Cr14MoVa		0,07	13,4	0,3	–	Si 0,3; V 0,20		245	441	25	nuclear



DUPLEX STEELS

TUBACEX NUMBER	ASTM TUBE STANDARDS A789 A790		EN TUBE STANDARDS 10216-5 10297-2		ELEMENTS (TYPICAL VALUES) IN %					MECHANICAL PROPERTIES AT ROOM TEMPERATURE				REMARK
	type	UNS	steel name	steel N°	C	Cr	Mo	Ni	others	hardness $HRC_{max.}$	yield $R_{p0,2\ min}$ [MPa]	tensile $R_{m\ min}$ [MPa]	elong. [%]	
D05	2205	S31803 S32205	X2 Cr Ni Mo N 22 5 3	1.4462	max. 0,03	22,5	3,0	5,5	N 0,17	28	450	680	25	PRE Cr+3,3xMo+16xN ≥ 35
D06	255	S32550	X2 Cr Ni Mo Cu W N 25 6 3	1.4507	max 0,03	25,0	3,4	6,0	N 0,2	31	550	760	20	
D07	2507	S32750	X2 Cr Ni Mo N 25 7 4	1.4410	max. 0,03	25,5	3,5	7,0	N 0,28	32	550	800	20	PRE Cr+3,3xMo+16xN ≥ 40 for umbilical tubes PRE ≥ 42,5
D08		S32760	X2 Cr Ni Mo Cu W N 25 7 4	1.4501	max. 0,03	25,0	3,7	7	N 0,24; W 0,7; Cu 0,7	28	550	800	25	PRE Cr+3,3xMo+16xN ≥ 40 for umbilical tubes PRE ≥ 42,5

Ferrite content general 40 to 60%

UREA INDUSTRY STEELS

TUBACEX NUMBER	ASTM TUBE STANDARDS A213 A269 A312 A789 A790		EN TUBE STANDARDS 10216-5 10297-2 STAHLEISENLISTE		ELEMENTS (TYPICAL VALUES) IN %					MECHANICAL PROPERTIES AT ROOM TEMPERATURE				REMARK
	grade / type	UNS	steel name	steel N°	C	Cr	Mo	Ni	others	hardness HB_{max}	yield $R_{p0,2\ min}$ [MPa]	tensile $R_{m\ min}$ [MPa]	elong. [%]	
C07	–	S30600	X1 Cr Ni Si 18 15	1.4361	max.0,012	17,5	–	15,0	Si 4,0; Mn 0,7	210	240	540	35	
C10	TP304L	S30403	X2 Cr Ni 19 11 - S	1.4306S	max. 0,015	18,2	–	12,0	–	192	180	485	35	
C26	TP316LUG	S31603	X2 Cr Ni Mo 18 14 3	1.4435	max.0,02	17,5	2,7	13,5	–	192	190	490	40	
C35	TP310MoLN	S31050	X1 Cr Ni Mo N 25 25 2 X1Cr Ni Mo N 25 22 2	1.4465 1.4466	max.0,02	25	2,2	22,0	N 0,12	217	260	540	40	
D06	255	S32550	X2 Cr Ni Mo Cu W N 25 6 3	1.4507	max 0,03	25,0	3,4	6,0	N 0,2	297	550	760	20	
T19	–	–	X1 Cr Ni 25 21	1.4335	max. 0,02	25,5	–	21,5	–	190	180	470	40	

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HIGH ALLOYED STEELS

TUBACEX NUMBER	COMMON TRADE NAME	ASTM TUBE STANDARDS		EN / DIN / VDTUEV STANDARDS			ELEMENTS (TYPICAL VALUES) IN %					MECHANICAL PROPERTIES AT ROOM TEMPERATURE COLD WORKED ANNEALED HOT WORKED ANNEALED				MAXIMUM OPERATING TEMP. IN AIR
		UNS	**standard**	**steel name**	**steel N°**	**standard**	**C**	**Cr**	**Mo**	**Ni**	**others**	**hardness HB_{max}**	**yield $R_{p0,2\ min}$ [MPa]**	**tensile $R_{m\ min}$ [MPa]**	**elong. [%]**	**T [°C]**
K03	Alloy 825	N08825	B 163 B 423	Ni Cr 21 Mo	2.4858	VdTUEV 432/2	max. 0,025	21,5	2,7	40	Cu 1,7; Ti 0,8	240 190	241 172	586 517	30 30	550
K05	Alloy 28	N08028	B 668	X1 Ni Cr Mo Cu N 31 27 4	1.4563	EN 10216-5 EN 10297-2 VdTUEV 483	max.0,03	27,0	3,5	31,0	Cu 1,0	~ 150	214 –	500 –	40 –	550
K06	TP904L	N08904	B 677	X1 Ni Cr Mo Cu N 25 20 5	1.4539	EN 10216-5 VdTUEV 421	max. 0,02	20,0	4,5	25,0	Cu 1,4; N 0,06	190 –	230 –	530 –	35 –	550
K08	Alloy 800	N08800 N08810 N08811	B 163 B 407	X10 Ni Cr Al Ti 32 21	1.4876	EN 10297-2	0,07	20	–	31,0	Al+Ti = 0,85-1,0%	192 –	207 170	520 450	30 30	1100
K10	Alloy 800	N08800 N08810	B 163 B 407	X10 Ni Cr Al Ti 32 20 X10 Ni Cr Al Ti 32 21 X5 Ni Cr Al Ti 31 20 X8 Ni Cr Al Ti 32 21	1.4876 1.4876 1.4958 1.4959	EN 10216-5 EN 10297-2 VdTUEV 412 VdTUEV 434	0,07	20	–	31,5	Al+Ti <0,7	192 –	207 170	520 450	30 30	1100
K11	Alloy 20	N8020	B 729	Ni Cr 20 Cu Mo	2.4660	DIN 17751	max.0,05	20	2,5	35,0	Cu 3,5; Nb+Ta ≥ 8xC	220 –	240 –	550 –	40 –	500
K12	Alloy 600	N06600	B 163 B 167	Ni Cr 15 Fe	2.4816	DIN 17751 VdTUEV 305	0,04	15,5	–	min. 72	Fe 8,0	180 –	241 170	552 515	30 35	1150
K14	254 SMO	S31254	A 269 A 312	X1 Cr Ni Mo Cu N 20 18 7	1.4547	EN 10216-5 EN 10297-2 VdTUEV 473	max. 0,02	20,0	6,25	18,0	Cu 0,75; N 0,2	210 –	300 –	650 –	35 –	500
K16	Alloy 625	N06625	B 444	Ni Cr 22 Mo 9 Nb	2.4856	DIN 17751 VdTUEV 499	max.0,03	21,5	9,0	min.58	Nb 3,65	200 –	276 –	690 –	30 –	1000
K17	Alloy 617	N06617	B 167	Ni Cr 23 Co 12 Mo	2.4663	VdTUEV 485	0,07	22,0	9,0	65	Co 12; B 0,004; Al 1,1	230 –	300 –	700 –	35 –	1000
K18	Alloy 690	N06690	B 163 B 167	Ni Cr 29 Fe	2.4662	–	max.0,05	29,0	–	min. 58	Fe 9		241 (under 5") 170	586 515	30 35	1000
C36	P505	nonmagnetic austenitic steel magn. permeability (μr) max. 1.01		X2 Cr Ni Mo N 22 15	1.3951	–	max. 0,03	22,75	1,4	15,0	N 0,33	max. 45 HRC cold strained	400 –	730 –	40 –	550